Ecosupport, first results from RCO based numerical simulations

FoUo, SMHI

Ecosupport Workshop, October 15th 2009, Norrköping
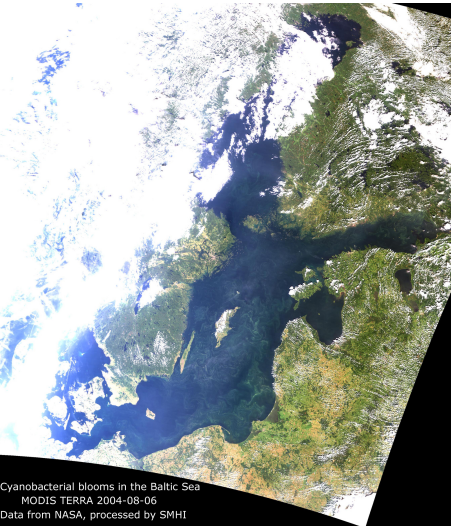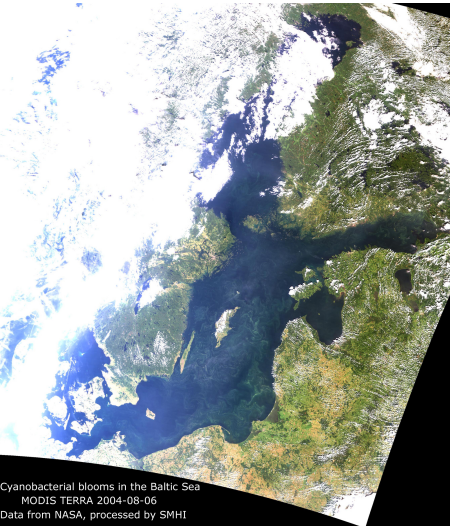
Outline

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Goal

Cyanobacterial blooms in the Baltic Sea
MODIS TERRA 2004-08-06
Data from NASA, processed by SMHI

- Our main task for our WP...

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Cyanobacterial blooms in the Baltic Sea
MODIS TERRA 2004-08-06
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- Our main task for our WP...
- Provide a climate simulation of the Baltic Sea from physical and biogeochemical points of view

Outline

1. *The Ecosupport Project*

2. *Forcing dataset*

3. *Results*
   - Sea Surface Height
   - Salinity & Salt Content
     - Surface Salinity
     - Bottom Salinity
   - Sea ice

4. *Conclusions*

- Atmospheric forcing

Having a forcing dataset requires...

- Atmospheric forcing
- Lateral boundary conditions

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- Runoff

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- Lateral boundary conditions
- Runoff
- Nutrient loads

... until year 2100

Atmospheric forcing

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$\implies$ RCA 3 forced by ECHAM 5 at the lateral boundary conditions, interpolated on the RCO grid
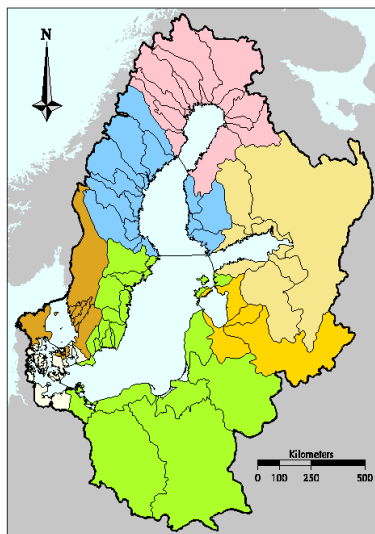
Runoff

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- Evaporation -Precipitation extracted from RCA 3 for each sub-basin of the Baltic Sea

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- Evaporation -Precipitation extracted from RCA 3 for each sub-basin of the Baltic Sea
- For each month, the runoff of a basin is assumed to depend on E-P of the 12 months before
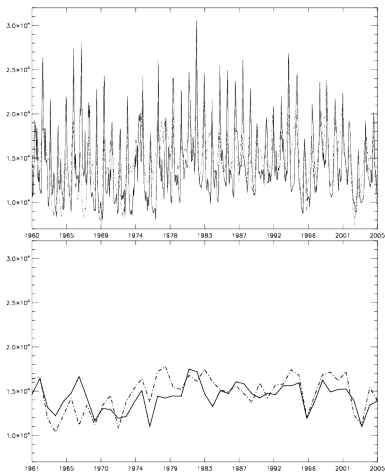
Runoff

- Runoff dataset
- Evaporation -Precipitation extracted from RCA 3 for each sub-basin of the Baltic Sea
- For each month, the runoff of a basin is assumed to depend on E-P of the 12 months before
- The present climate runoff is supposed to be a "unit" against which runoff in other climates can be estimated
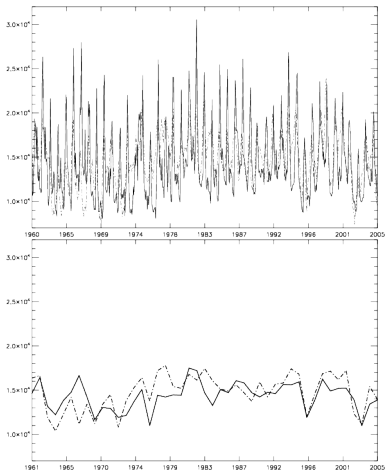
Runoff

Plain line : measured runoff, dashed
line : reconstructed runoff

- If we apply this simple model to RCA3-ECHAM5 climate simulations...

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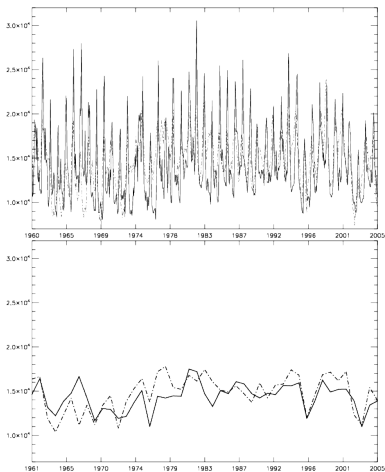- and also apply some statistical corrections...

Runoff

Plain line : measured runoff, dashed line : reconstructed runoff

- If we apply this simple model to RCA3-ECHAM5 climate simulations...
- and also apply some statistical corrections...
- ..we get an increase of about 4000 m^3 at the end of the century

Lateral Boundary Condition

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- Sea surface height in Kattegat

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- Sea surface height in Kattegat
- computed from meridional sea level pressure gradient over western europe and some correlation coefficients
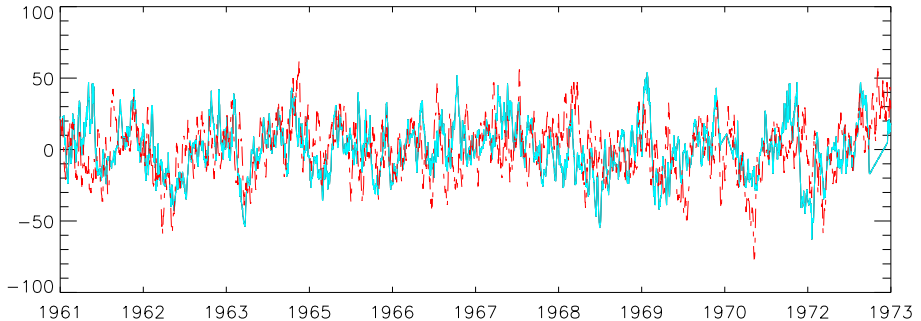
Lateral Boundary Condition

- Sea surface height in Kattegat
- computed from meridional sea level pressure gradient over western europe and some correlation coefficients
- the sea level pressure gradient is too smooth in ECHAM5 (probably because of the 50km resolution), so we boost it up using statistical corrections
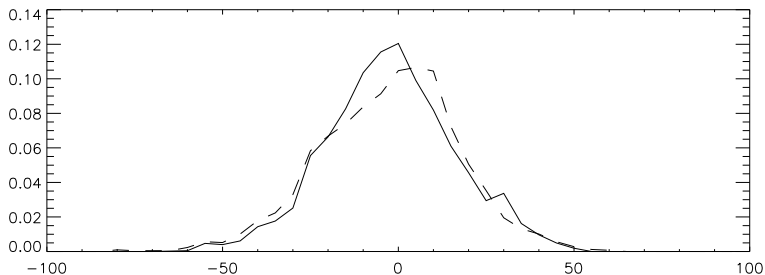
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SSH at Landsort

Blue : hindcast simulation, Red : climate simulation. The seasonal cycle is well reproduced.

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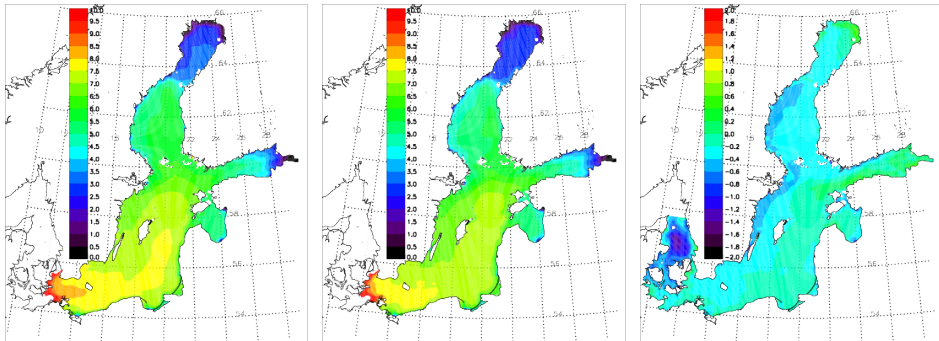Conclusions

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SSH at Landsort - PDF

Observed (plain) and simulated (dashed) ssh probability density function at Landsort.

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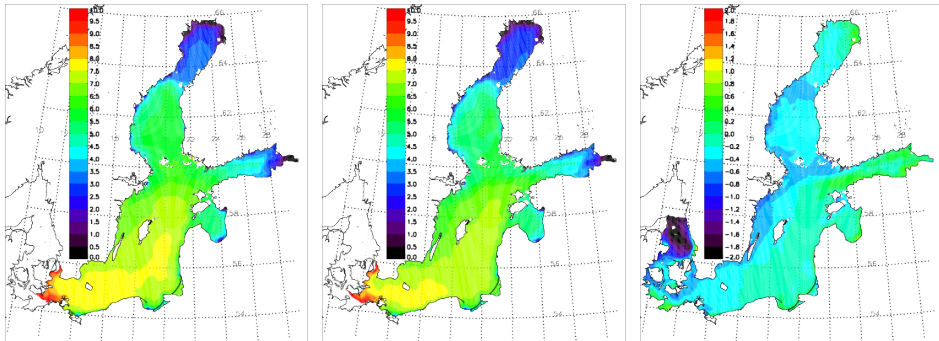## Mean salinity for the entire domain
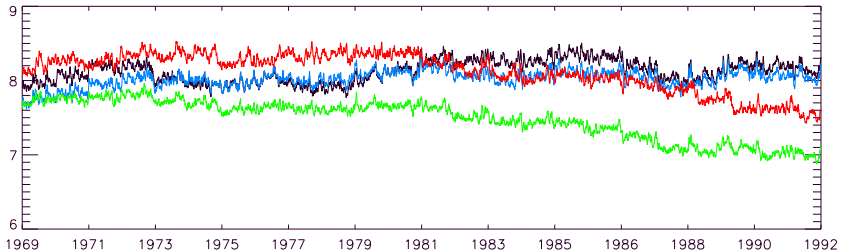
Red : hindcast simulation, **Green :** climate forcing only for atmospheric forcing, **Blue :** climate forcing for atmospheric forcing and ssh, **Black :** Full climate forcing simulation

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Surface salinity variability

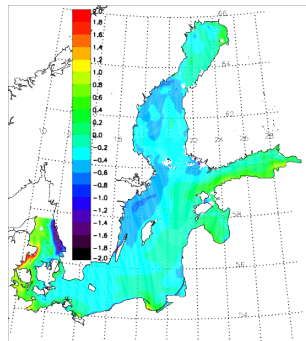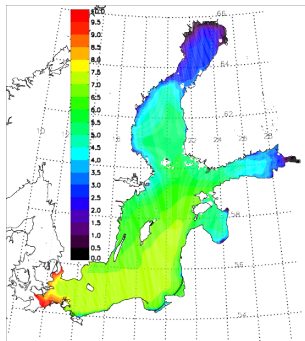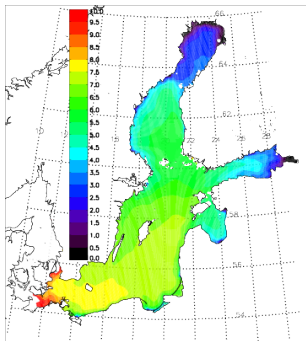**Winter**. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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Surface salinity variability

Spring. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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Summer. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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Autumn. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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Bottom salinity variability

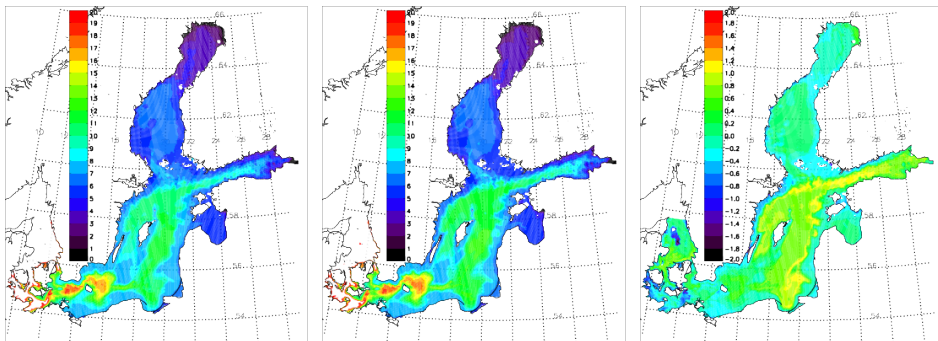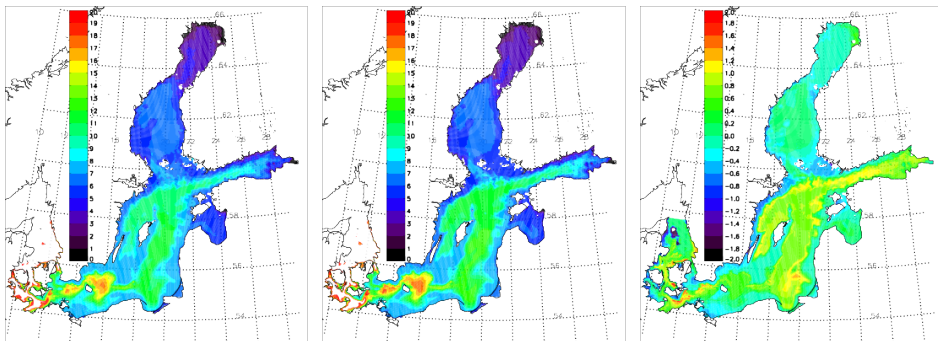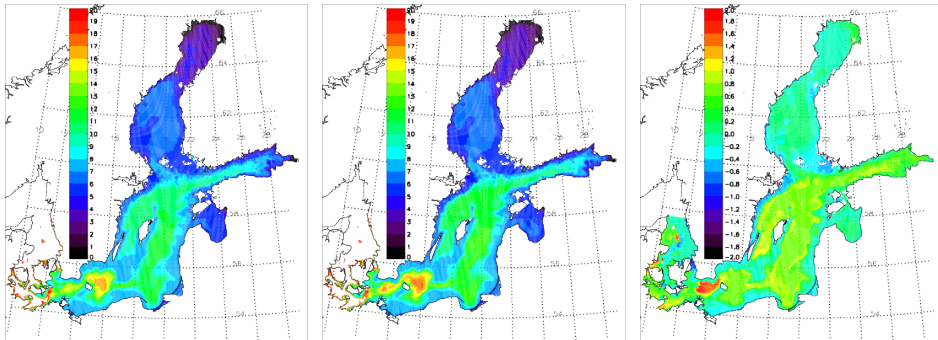**Winter**. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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Summer. From left to right : Hindcast simulation, Climate simulation & Differences between the two.

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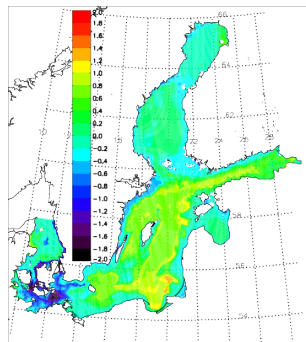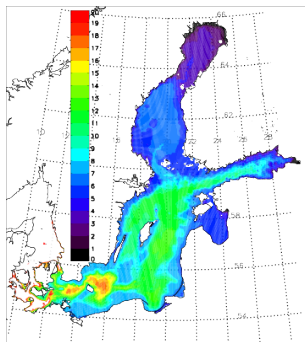**Results**
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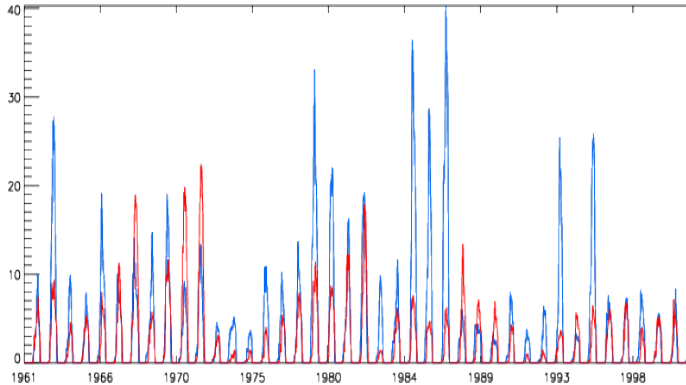**Results**
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Sea ice cover extent

Blue : hindcast, **Red :** climate

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Mean ice thickness

Blue : hindcast, **Red :** climate

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Mean S,T for the computation domain

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